Results of New Cultivar Selection Trials for Lemon in Arizona – 2003-04[1]

Glenn C. Wright
Department of Plant Sciences, U. of A., Yuma Mesa Agriculture Center, Yuma, AZ

Abstract

Three lemon cultivar selection trials are being conducted at the Yuma Mesa Agriculture Center in Somerton, AZ. Data from these trials suggest that 'Limonero Fino 49' selections may be a suitable alternative for the varieties most commonly planted in Southwest Arizona today. 'Cavers Lisbon' and 'Villafranca' might also be planted on an experimental basis

Introduction

The Arizona lemon industry has historically relied on a small number of lemon cultivar selections. In the 1950's, the industry was established with 'Desert Lisbon', however within a few years, 'Desert Lisbon' was eclipsed in popularity by 'Frost Nucellar Lisbon' the only nucellar clonal selection of the 'Lisbon' cultivar. Other minor selections of 'Lisbon' that were planted in Arizona from the 1960's through the 1980's included 'Monroe', 'Prior', and 'Rosenberger'. Beginning in the late 1980's, new plantings were established using 'Limoneira 8A Lisbon'. More recently, 'Corona Foothills Lisbon' is increasingly popular. 'Allen Eureka' has also been occasionally planted in Arizona.

All of these represent clonal selections of outstanding trees that were then propagated. Typically, they are identified by their originator or place of origin, and are valuable to Arizona growers because of their high vigor, high productivity, precocity (trees bear at an early age), earliness (a high percentage of the fruit can be harvested before 1 November), short thorns and good fruit quality. When a commonly grown lemon cultivar selection is gradually replaced in the industry, the new selection typically is improved in one of these characteristics. Sometimes a cultivar selection may be replaced because of a negative characteristic. Such was the case with 'Frost Nucellar Lisbon' which appears to be susceptible to brown heartwood rot.

From the late 1980's, to the early 1990's, Arizona lemon growers have received their information about new cultivar selections through word of mouth or from nursery sources, since there were no trials planted in the state. With this in mind, we have planted three new lemon cultivar selection trials in 1995, 1997 and 1999, all located at the Yuma Mesa Agricultural Center. Technical difficulties prevented the harvesting of the 1995 trial in 2003-04. Previous results from these trials have been reported in prior issues of the Citrus Research Report.

Materials and Methods

[1] The author wishes to thank Mr. Phillip Tilt, Mr. Marco Peña, Mr. Arturo Moreno, and the Yuma Mesa Fruit Grower's Association for their assistance in completing this project. The author would also like to thank the Arizona Citrus Research Council for supporting this research. This is a partial final report for project 2003-06 – Citrus rootstock and cultivar breeding and evaluation for the Arizona citrus industry – 2003-04.

1997 Lemon Cultivar Selection Trial. This trial, comprising 13 cultivar selections, was established in March 1997 in Block 22 of the Yuma Mesa Agricultural Center, near Yuma, Arizona. The land was laser leveled and fumigated prior to planting. Trees were planted on an 8-m x 8-m spacing. Fifteen trees of each selection were planted. This trial includes the following selections:

- 'Allen Eureka' – The most common and popular 'Eureka' selection planted in Arizona. Originated in Santa Paula, CA
- 'Arancino' – A minor Italian cultivar, with rounded fruit, a short nipple and thick rind. Fruit is seedy.
- 'Berna' ('Verna') – The common summer lemon of Spain. Thornless tree produces medium to large fruit with few seeds.
- 'Cavers Lisbon' – A vigorous 'Lisbon' selection originating in Upland, CA.
- 'Cascade Eureka' – Another, less-commonly planted, vigorous selection that originated in San Diego County, CA.
- 'Cook Eureka' – A selection from Limoneira Del Mar Ranch, Ventura County, California.
- 'Corpaci' – A minor Italian cultivar from Sicily. Vigorous, thorny trees are reportedly productive. Fruit matures early and has few seeds.
- 'Femminello Comune' – Italian, everbearing cultivar.
- 'Limoneira 8A Lisbon' – A vigorous selection originating from the Limoneira Ranch, Ventura County, CA. The most popular lemon planted in Arizona today.
- 'Limonero Fino 49' – The chief winter lemon of Spain. Reportedly vigorous, thorny and highly productive. Early producer with uniform yield. Fruit is spherical to oval, with a smooth rind and a relatively short nipple. Relative high acid and about five seeds per fruit.
- 'Primofiori' – Originated in Spain. Similar to the 'Limonero Fino 49' described above.
- 'Santa Teresa' (Femminello Santa Teresa) – Similar to 'Femminello Comune', but resistant to the Mal Secco disease prevalent in Italy.
- 'Villafranca' – Said to be of Sicilian origin, introduced into Florida in 1875. Formerly planted in California, but of little importance there today. Fruit and tree characteristics similar to 'Eureka', but produces mainly a winter crop.

1998 Lemon Cultivar Selection Trial. This trial, comprising 7 cultivar selections, was established in late September 1998 in Block 14 of the Yuma Mesa Agricultural Center, near Yuma, Arizona. The land was laser leveled and fumigated prior to planting. Trees were planted on an 8-m x 8-m spacing. Fifteen trees of each selection were planted. This trial includes the 'Limoneira 8A Lisbon' described above as well as the following additional cultivar selections:

- 'Dr. Strong Lisbon' –Originated at the Glen Good ranch, Santa Paula, CA. Large fruit, but tree is reportedly precocious.
- 'Genoa' – Similar to the 'Villafranca', imported from Italy to the U.S. in 1881.
- 'Lapithotiki' – Originated in Cyprus. Reportedly harvested from September until March. Fruit is tapered at both ends.
- 'Monroe Lisbon' – Vigorous selection. Reportedly bears early, but fruit is small and coarse.
- 'Taylor Eureka' – A nucellar selection, originating in Australia. Reportedly produces late.
- 'Walker Lisbon' – Vigorous selection from California.

Yield data is collected during the fall and winter. Trees were ring or strip-picked as noted below. For 2003-04, trees in the 1997 trial were ring picked on 11-4-03 and strip picked on 2-18-04. Trees in the 1998 trial were strip picked on 11-4-03 For each harvest date, the entire quantity of harvested fruit from each tree was passed through an automated electronic eye sorter (Autoline, Inc., Reedley, CA), which provides weight, color, exterior quality and size data for each fruit. Fruit packout data is reported on a percentage basis. Fruit grade data was not collected in 2003-04 due to a machine malfunction. Fruit quality data, including include °brix, peel thickness, percentage juice, pH, and total soluble solids to total acid ratio will be collected beginning in 2004-05.

All data was analyzed using SPSS 11.0 for Windows (SPSS Inc., Chicago, Illinois).

Results and Discussion

1997 Lemon Selection Trial. Yields of this trial, since its inception, are found in Figure 1. Because of the large number of selections in this trial, the graph has been split for ease of viewing. Selections that have had superior yields include 'Cascade Eureka', 'Cook' Eureka, 'Limoneira 8A Lisbon', 'Limonero Fino 49', 'Primofiori', 'Femminello Comune' and 'Villafranca'. 'Santa Teresa performed well in 2002-03, but fell off in 2003-04. 'Allen Eureka', 'Arancino', 'Berna' 'Corpaci', and 'Cavers Lisbon', have not performed as well.

Yield for the 2003-04 season is shown in Figure 2. 'Femminello Comune' and 'Limoneira 8A had the highest yields, but five other selections were not statistically different. 'Arancino', 'Berna', 'Cavers', 'Corpaci' and 'Santa Teresa' were the poorest performers for this season. 'Femminello Comune' and 'Limonero Fino 49' had the most early season yield, but ' 'Cascade', 'Cavers', 'Cook', 'Limoneira 8A', 'Primofiori' and 'Villafranca' were not statistically different.

Packout for the 11-04 harvest, of seven of the most promising selections is shown in Figure 3. While most of these had similar size, 'Cavers', 'Femminello Comune', and 'Limonero Fino 49' had slightly larger fruit, while 'Santa Teresa' and 'Limoneira 8A' had smaller fruit. 'Since the yield of 'Cavers' is so low, it is doubtful that the larger fruit for this cultivar is of any real advantage. 'Limonero Fino 49 has had larger fruit for several of the past few seasons.

1998 Lemon Cultivar Selection Trial. 2001-02 to 2003-04 yields from this trial are found in Figure 4. The 'Limoneira 8A' is still the class of this trial; no other selection has surpassed it in total yield since 2001-02. The 'Dr. Strong Lisbon' is not statistically different than the 'Limoneira 8A Lisbon' (Figure 5), and most of the others have yields within about 30% of 'Limoneira 8A'. Only Genoa is lagging.

Fruit size for this trial is shown in Figure 6. The 'Lapithiotiki' has outstanding size, but it is an elongated lemon, and is probably unsuitable for the US market. Of the others, 'Dr. Strong appears to have the best size at this time, while 'Taylor' Eureka has the smallest fruit.

Conclusions

One new lemon cultivar selection appears promising for Arizona. This is 'Limonero Fino 49' lemon, because its yields are similar to that of 'Limoneira 8A' and it has larger fruit size. 'Femminello Comune' and 'Villafranca' may also be suitable, but neither consistently equals or surpasses 'Limoneira 8A Lisbon' lemon in terms of overall yield and/or earliness as often as does 'Limonero Fino 49'. 'Santa Teresa' had excellent yield last year, but stumbled this year, and is hobbled by its lateness. In the 1998 trial, no selection is better than 'Limoneira 8A', but 'Walker' and 'Dr. Strong' may be contenders. No other new selections stand out at this time; however this may change as more data is collected. 'Eureka' lemons have typically performed poorly in comparison to the 'Lisbons', and should not be considered as a replacement for any of the high-yielding 'Lisbon' selections.

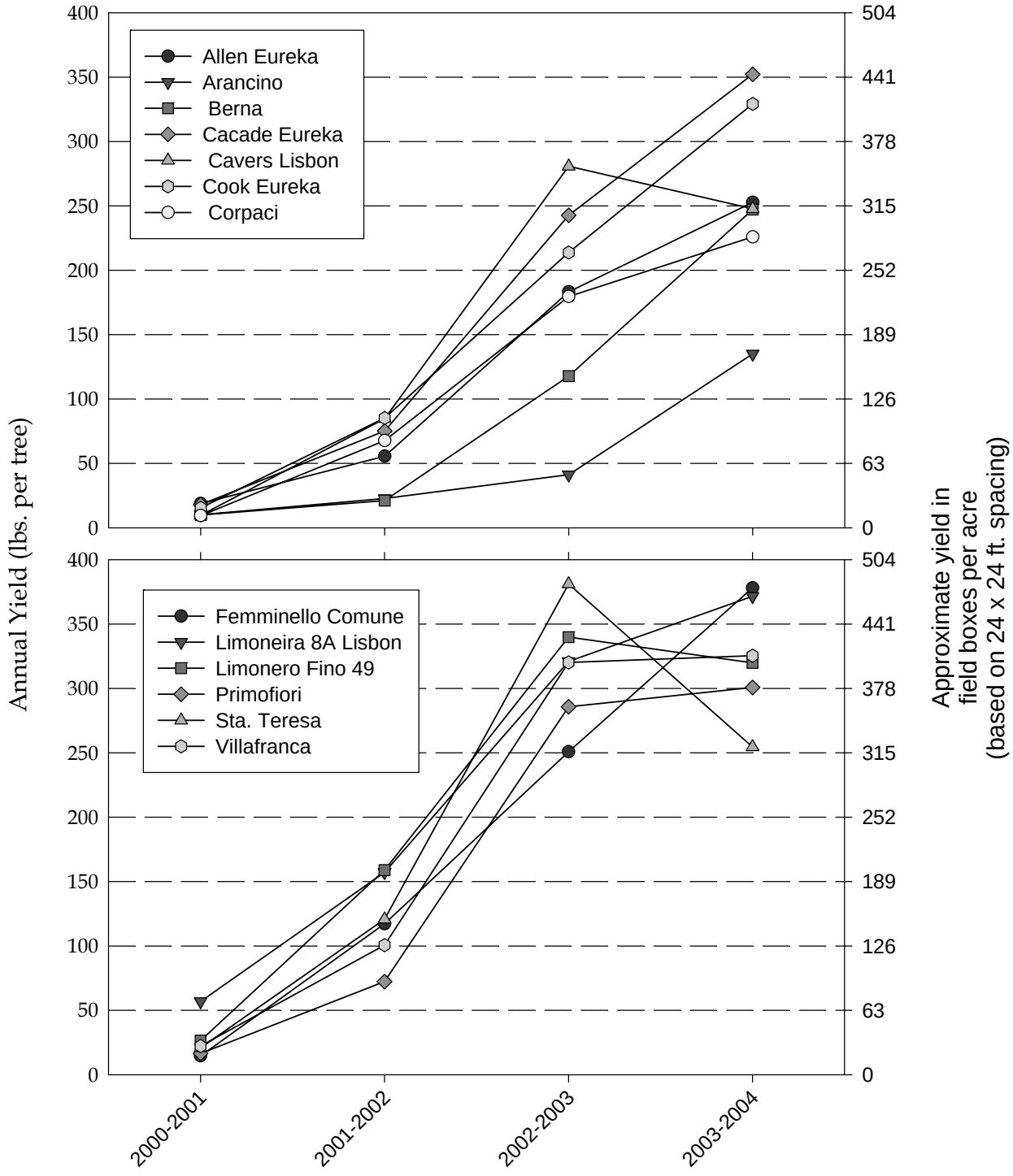

Figure 1. 2000-2004 yield of thirteen lemon selections budded to *C. macrophylla* rootstock.

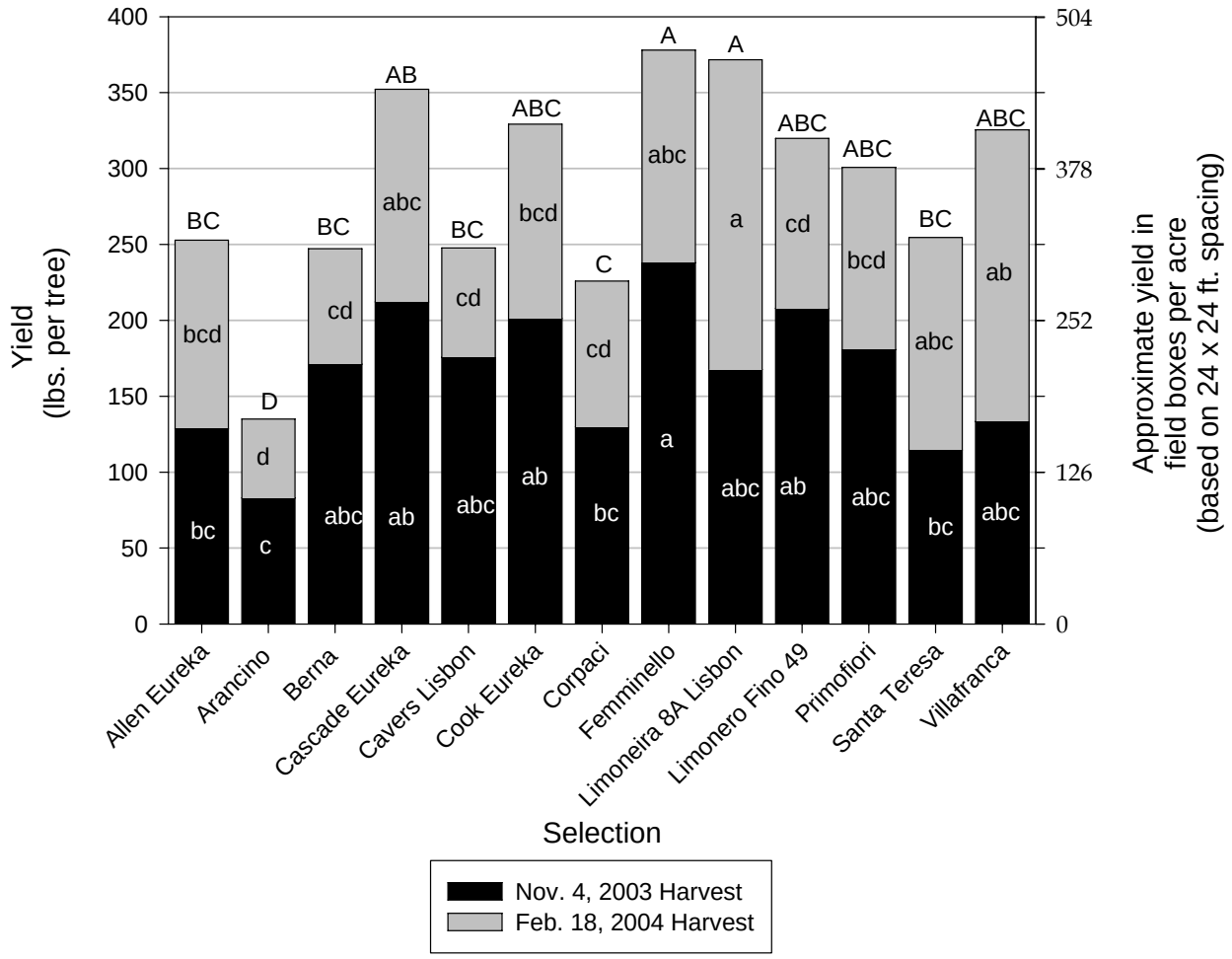

Figure 2. 2003-04 Yield of thirteen lemon selections budded to *C. macrophylla* rootstock, separated by harvest time. Bars of the same shade are significantly different if the lowercase letters within them are different. Bars of different shades cannot be compared. Overall yield for the year can be compared using the uppercase letters above each stacked bar.

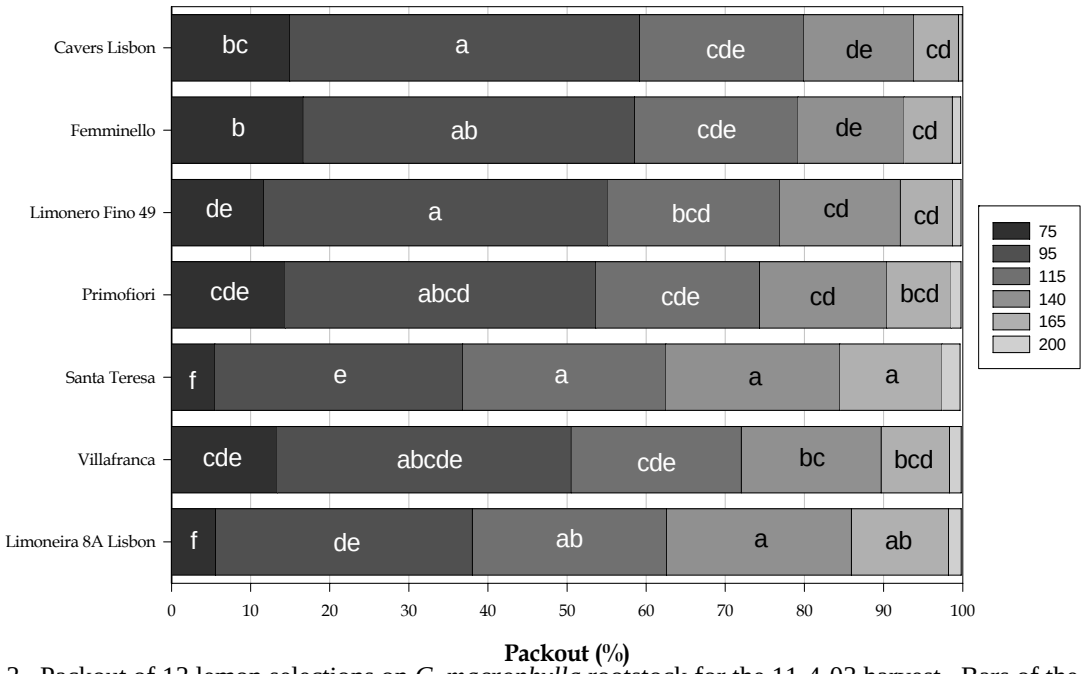

Figure 3. Packout of 13 lemon selections on *C. macrophylla* rootstock for the 11-4-03 harvest. Bars of the same shade are significantly different if the lowercase letters within them are different. Bars of different shades cannot be compared.

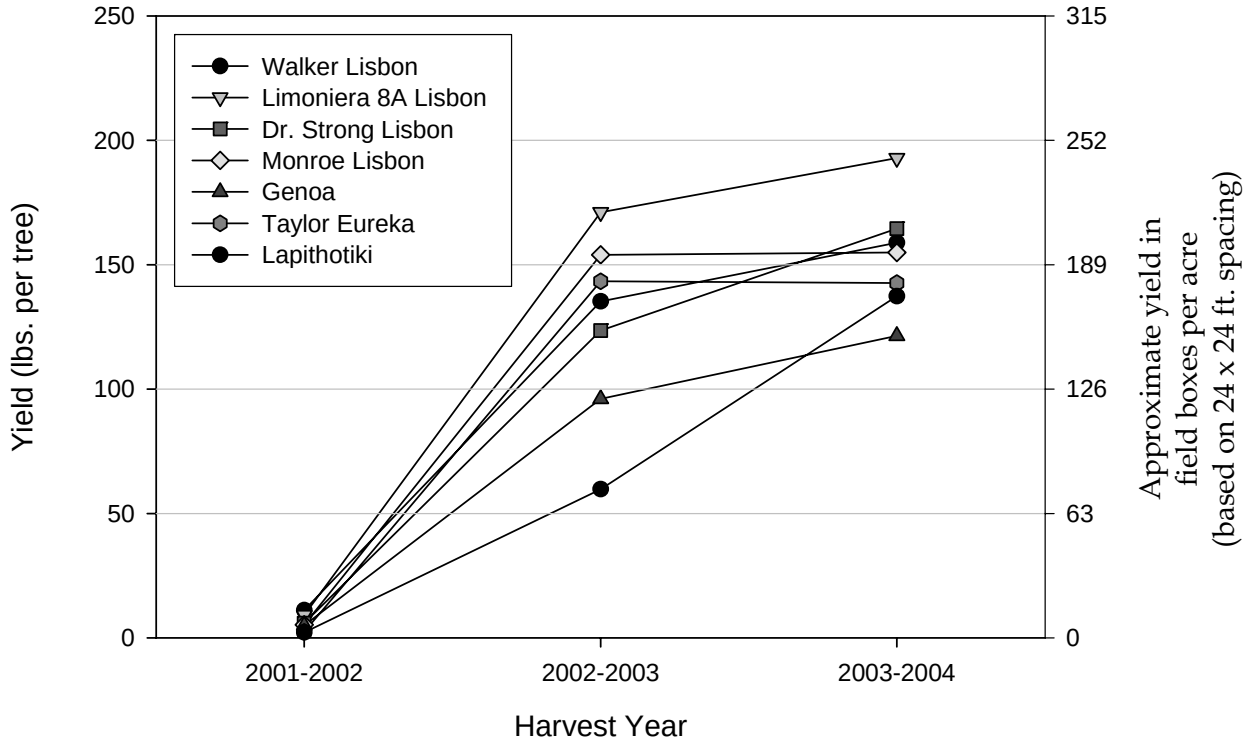

Figure 4. 2003-2004 yield of seven lemon selections budded to *C. macrophylla* rootstock.

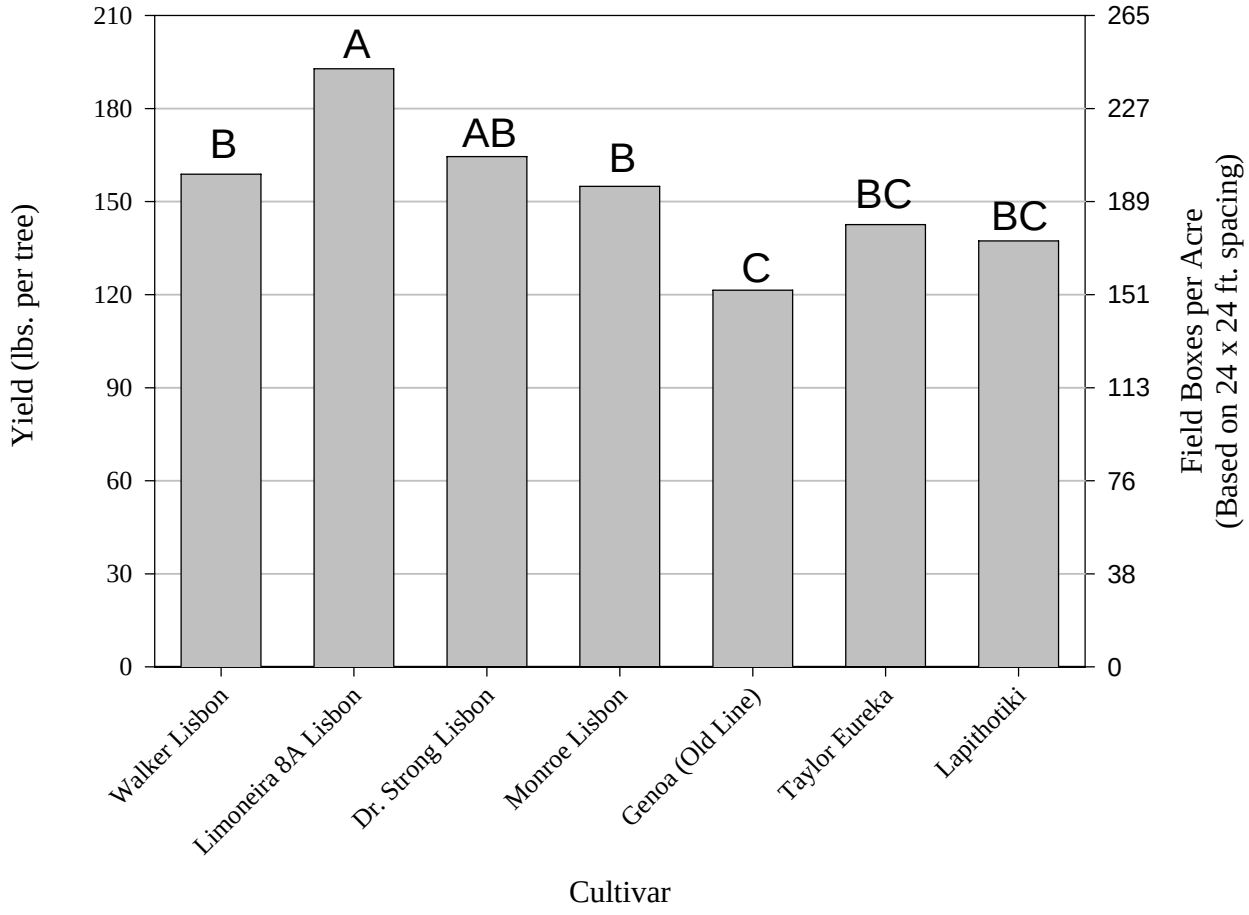

Figure 5. 2003-04 yield of seven lemon selections budded to *C. macrophylla* rootstock. Overall yield for the year can be compared using the uppercase letters above each bar.

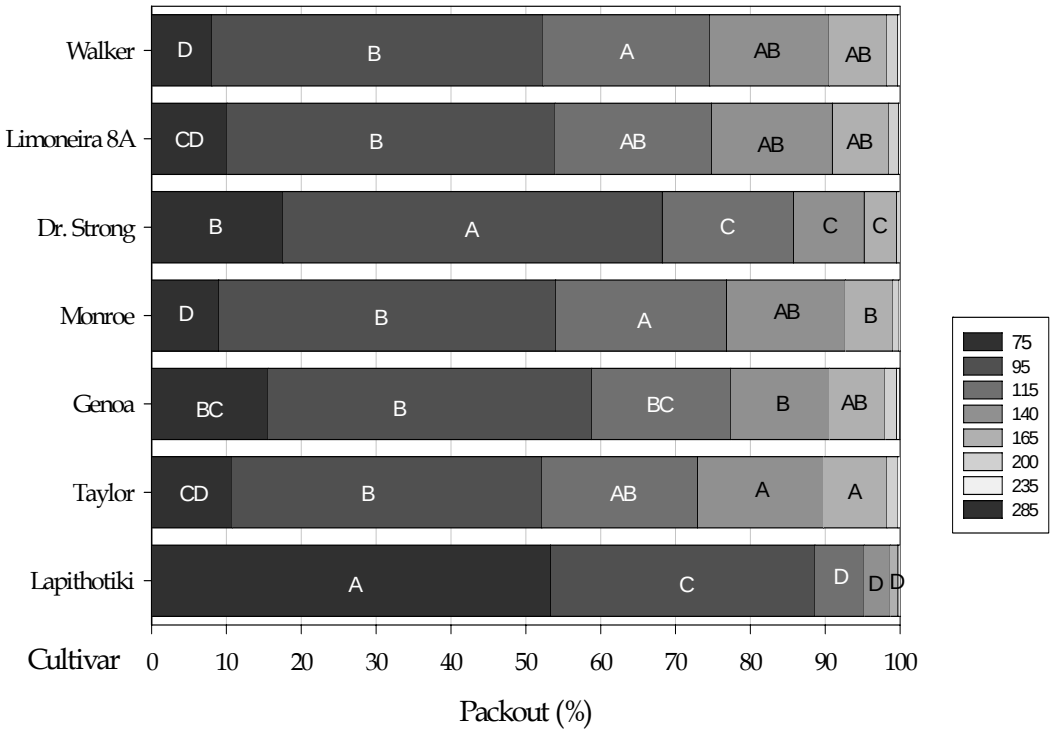

Figure 6. Packout of seven lemon selections on *C. macrophylla* rootstock for the 11-4-03 harvest. Bars of the same shade are significantly different if the lowercase letters within them are different. Bars of different shades cannot be compared.